

TITLE VII

RULES GOVERNING DESIGN AND OPERATION OF DAMS [As Restated October, 1993]

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TITLE VII

RULES GOVERNING DESIGN AND OPERATON OF DAMS [As Restated October, 1993]

SUBTITLE I. GENERAL PROVISIONS

Section 701.1. PURPOSE.

- A. Provide for the comprehensive regulation and supervision of dams for the protection of the health, safety, welfare, and property of the citizens of Arkansas.
- B. Assure proper planning, design, construction, maintenance, monitoring and supervision of dams, including such preventive measures as are necessary to provide an adequate margin of safety.

Section 701.2. AUTHORITY.

Rules governing design and operation of dams within the State of Arkansas are promulgated under authority of Subchapter 2 of Chapter 22 of title 15 of the Arkansas Code of 1987.

Section 701.3. SCOPE OF REGULATIONS.

All dams within the State of Arkansas, except those owned by the United State Government or those exempted by Section 701.4, must have a valid construction and operation permit issued under the provisions of this title.

Section 701.4. EXEMPTIONS.

Dams meeting either of the following criteria are not subject to rules contained in this title, unless Section 701.5 of this title is successfully invoked.

- A. Dams with height less than 25 feet.
- B. Dams with normal storage less than 50 acre-feet.
- C. Dams with crest elevations below the ordinary high water mark of the stream at that location.

Section 701.5. PETITION BY AFFECTED PERSONS.

Persons who believe themselves or their property to be endangered by failure of a dam which is below the size requirements specified in Section 701.4 may file a petition requesting that the Commission require permitting and compliance with dam safety regulations for that dam.

- A. Commission Investigation. Upon receipt of such petition, the Executive Director shall immediately begin an investigation of the petitioner's allegations.
- B. Public Hearing. As a part of the Commission's investigation, a Public Hearing shall be held within the county in which the dam is located. Notice of the hearing shall be published in a manner consistent with Section 702.8.
- C. Commission Order. Upon consideration of staff findings and testimony received, the Commission shall issue an order either approving or denying the petitioner's request.

Section 701.6. DUTIES, OBLIGATIONS, AND LIABILITIES OF DAM OWNERS.

Nothing in these rules shall be construed to relieve an owner or operator of a dam or reservoir of the legal duties, obligations, or liabilities incident to ownership or operation.

Section 701.7. NO LIABILITY BY COMMISSION, EMPLOYEES, OR AGENTS.

No action shall be brought against the State or the Commission or its employees or agents for the recovery of damages caused by the partial or total failure of any dam or reservoir or through the operation of any dam or reservoir upon the grounds that the aforementioned parties are liable by virtue of any of the following:

- A. The approval of the dam or reservoir, or approval of flood-handling plans during construction;
- B. The issuance or enforcement of orders relative to maintenance and operation of the dam or reservoir;
- C. Inspection, control and regulation of the dam or reservoir;
- D. Measures taken to protect against failure during an emergency.

Section 701.8. EXCEPTIONS.

The Commission may grant exceptions to requirements contained within this title. Any variance from these rules must be supported by written approval of the Commission's Executive Director setting forth the reason for its granting and the limits placed thereon.

SUBTITLE II. PERMITS FOR DAMS

Section 702.1. CONSTRUCTION PERMIT.

A permit issued by the Commission is required prior to construction of any dam not exempted under Sections 701.3 or 701.4 of this title.

Section 702.2. OPERATION PERMIT.

- A. Before water is deliberately impounded by closing drain gates on a newly constructed dam, an operation permit must be issued by the Commission. An operation permit will be issued by the Chief Engineer upon completion of final inspection and receipt of the Certificate of Substantial Compliance by the owner's engineer. (See Section 706.6).
- B. An operation permit is required for all existing dams not exempted under Sections 701.3 or 701.4 of this title.

Section 702.3. TRANSFER OF PERMIT.

Within six (6) months after change of ownership of a permitted dam, the new owner shall notify the Commission. The Commission shall issue a dam permit in the name of the new owner.

Section 702.4. WATER PLAN COMPLIANCE.

Filing of an application to permit a proposed dam also serves as filing for Water Plan Compliance Certification as described in Section 602.5 of the Commission's rules. The water plan compliance process may run concurrently with the dam permit review.

Section 702.5. APPLICATION.

Applicants for dam permits must provide all applicable information requested on the form supplied by the Commission.

Section 702.6. COMMISSION REVIEW.

Upon receipt of application for dam permit, the Commission staff will review data presented to determine compliance with State law, Commission rules, and accepted engineering practices. If necessary, the staff may request additional data to insure compliance.

Section 702.7. PUBLIC NOTICE.

Upon completion of Commission review, the Executive Director will cause a Public Notice to be published two times, one week apart. The Public Notice will be placed in a newspaper having general circulation in the county in which the dam is/will be located. Information in the public notice will include: the owner's name and address, the dam's location and pertinent physical data describing the dam. In addition, the Public Notice will request that questions, comments and objections to the dam's permitting and/or requests for public hearing be forwarded in writing to the Commission for action within twenty (20) days after the second publication.

Section 702.8. PUBLIC HEARING.

If requested, the Executive Director shall cause a Public Hearing to be conducted within the county in which the dam is/will be located. Said hearing will be for the purpose of describing the proposed actions and taking testimony regarding the public view of the proposal. The Executive Director shall cause publication of a public notice describing the time, place and purpose of the Public Hearing. Copies of the public notice shall be furnished to the owner(s), complainant(s) and adjacent landowners (if known). Publication shall be in a newspaper having general circulation in the county in which the dam is/will be located. Notice shall be published twice, one week apart.

Section 702.9. COMMISSION ACTION.

A. If no Public Hearing is requested as a result of the Public Notice, the Executive Director will either approve or deny the permit request.

B. If a Public Hearing is requested as a result of the Public Notice, the Executive Director will approve or deny the permit request based upon the evidence presented.

C. Prior to issuance of the permit, a Water Plan Compliance Certification must be obtained as prescribed in Title VI of the Commission's rules, if applicable.

SUBTITLE III. FEES

Section 703.1. ESTIMATED APPLICATION REVIEW FEES.

Any application for permitting a proposed dam after March 24, 1993, shall be accompanied by a check for one percent (1%) of the estimated construction cost of the dam or \$100.00, whichever is greater, except that no application review fee shall exceed \$1000.00.

Section 703.2. FINAL COST REPORT.

The owner shall provide to the Commission a report of actual construction costs within forty-five (45) days after completion of construction.

Section 703.3. FINAL APPLICATION REVIEW FEES.

A. If the estimated application review fee exceeds the fee based on actual construction cost, an amount equal to the difference will be refunded.

B. If the fee based on construction cost exceeds the estimated application review fee, an amount equal to the difference will be paid to the Commission.

Section 703.4. ANNUAL PERMIT FEE.

The annual permit fee shall be computed as specified in Ark. Code Ann. §15-22-219, as may be amended from time to time.

Excerpt from Ark. Code Ann. §15-22-219:

Any person obtaining a permit under the provisions of §15-22-210 shall, in consideration therefor, pay to the Commission a fee equal to twelve cents (12¢ per acre-foot of water which the dam involved is designed to impound, but not less than twenty-five dollars (\$25.00), nor more than ten thousand dollars (\$10,000.00). The permit shall provide that the same fee shall be paid by that person to the Commission each year thereafter during which the dam is maintained, on or before the anniversary date of the issuance of the permit.

The volume "the dam involved is designed to impound" is defined as the billing volume. (See Subtitle XII, GLOSSARY)

SUBTITLE IV. ENFORCEMENT

Section 704.1. NOTICE OF NON-EMERGENCY DEFICIENCY.

Upon discovery of a deficiency, which does not immediately threaten the dam's safety, the Chief Engineer will issue a letter specifying actions necessary to remedy the problem and requesting a schedule for implementing the required actions. Based on mutual agreement a consent order will be issued which will embody the agreed upon actions and timetable.

Section 704.2. PUBLIC HEARINGS.

In the event remedial measures for non-emergency deficiencies cannot be accomplished through the means of consent orders, the Executive Director shall cause a Public Hearing to be conducted to present the staff's proposed order and accept testimony. The hearing shall be conducted in the county in which the dam is located. Public notice of the hearing shall be provided in a manner consistent with Section 702.8 of this title.

Section 704.3. COMMISSION ORDERS.

After review of findings of the Public Hearing, the Commission may issue orders compelling specified actions.

Section 704.4. PENALTIES.

Non-compliance with commission rules or disregard of Commission orders may result in fines of up to \$10,000. In general, penalties will be set by doubling the costs incurred by the Commission.

Section 704.5. EMERGENCY REMEDIAL ORDERS.

Upon discovery of a condition which renders a dam subject to rapid failure, the Executive Director may issue an Emergency Remedial Order describing actions which must be taken to protect life and property.

Failure to comply with these orders may result in penalties under Section 704.4.

Section 704.6. APPEALS.

Actions by the Commission may be appealed as described in Subtitle V of Title I, *rules of Organization and General Operation of the Arkansas Soil and Water Conservation Commission.*

SUBTITLE V. DESIGN CRITERIA

Section 705.1. GENERAL STANDARDS.

All dams must be designed in accordance with currently accepted engineering practices. Acceptable guidelines include those published and recommended by the U.S. Army Corps of Engineers; U.S. Department of Agriculture, Soil Conservation Service; U.S. Department of Interior, bureau of Reclamation; and Federal Energy Regulatory Commission.

Section 705.2. REGISTERED PROFESSIONAL ENGINEER.

Preparation of all plans and specifications, and the construction, enlargement alteration, repair or removal of dams subject to Commission review shall be under the supervision of an engineer registered in this state.

Section 705.3. SIZE CLASSIFICATION CRITERIA.

Size classification is based on the more stringent of two categories, either height of dam or maximum storage, and shall be in accordance with Table 1 of this section.

Table 1		
SIZE CLASSIFICATION		
SIZE	MAXIMUM STORAGE (ACRE-FEET)	HEIGHT (FEET)
Small	50 to 1000	25 to 40
Intermediate	• 1000 And < 50,000	• 40 and < 100
Large	• 50,000	• 100

Section 705.4. HAZARD CLASSIFICATION CRITERIA.

All dams will be classified or reclassified as required to assure appropriate safety considerations. Hazard classification shall be based on the more stringent of either potential loss of human life or economic loss in accordance with Table 2 of this section. If doubt exists concerning classification, the more hazardous category must be selected.

NOTE: The hazard classification does not indicate the physical condition of a dam.

Table 2

HAZARD CLASSIFICATION

CATEGORY	LOSS OF HUMAN LIFE	ECONOMIC LOSS
Low	No	Minimal (No significant structures; pastures, woodland, or largely undeveloped land); less than \$100,000.
Significant	No	Appreciable (Significant structures, industrial, or commercial development, or cropland); \$100,000 to \$500,000.
High	Yes	Excessive (Extensive public, industrial, commercial, or agricultural development); over \$500,000.

NOTE: Loss of human life is based upon presence of habitable structures.

Section 705.5. SPILLWAY DESIGN FLOOD (SDF) FOR DAMS.

The size and hazard classifications are combined to determine the hydrologic criteria for dams.

A. The minimum acceptable spillway design floods (SDFs) for dams are shown in Table 3.

B. The minimum hydrologic criteria may be reduced if properly prepared dam breach analyses show that dam failure during the SDF would cause an increase in flood level of one foot or less at, and downstream of, the first habitable structure or financially significant development.

Table 3

SPILLWAY DESIGN FLOOD FOR DAMS

HAZARD CLASSIFICATION	SIZE	SPILLWAY DESIGN FLOOD
Low	Small	.25 PMF
	Intermediate	.25 to .50 PMF
	* Large	.50 to .75 PMF
Significant	Small	.25 to .50 PMF
	Intermediate	.50 to PMF
	Large	PMF
High	Small	.50 PMF to PMF
	Intermediate	PMF
	Large	PMF

NOTE: Where ranges are given in this table, the spillway design flood shall be determined by straight line interpolation, based upon the effective height of dam or maximum storage, whichever computed SDF is greater.

*SDF shall be extrapolated at the same rate of change as an intermediate size dam to a maximum of .75 PMF.

Section 705.6. DOWNSTREAM RELEASES.

Each dam constructed after the effective date of these regulations shall be equipped with a release port(s) designed to release a flow of water for instream and downstream riparian uses.

A. Minimum release quantities shall be sufficient to maintain existing instream and offstream uses and shall be defined after consideration of the best available low flow information.

B. Minimum release ports must be designed to operate without manual intervention.

Section 705.7. RESERVOIR DRAIN CONDUIT.

All proposed dams must include a permanent facility for draining the reservoir.

A. Such conduit shall have a minimum diameter of twelve (12) inches for watershed areas less than one square mile and eighteen (18) inches for watershed greater than one square mile. Such

conduits must be capable of lowering the surface of the reservoir at a rate not less than two (2) inches per day (at normal pool) while inflow to the reservoir is twice the annual average daily flow.

B. Operating equipment for the drain facility must be accessible from above the maximum design water surface, unless inlet design is such that the conduit is flowing at capacity at a lower elevation.

Section 705.8. STRUCTURAL CRITERIA.

As a minimum, the design must address the following:

- A. Slope stability under all probable loading conditions.
- B. Stability against sliding and overturning.
- C. Adequacy of foundation for imposed loads.
- D. Adequacy of energy dissipating devices at discharge points.
- E. Adequacy of channels and conduits for expected flows.
- F. Protection of embankments and other earth slopes from erosion.
- G. Stability against seismic forces for all "High or Significant Hazard" dams in Seismic Zones 2 and 3. (See Figure 1.)

SUBTITLE VI. CONSTRUCTION REQUIREMENTS

Section 706.1. PLANS AND SPECIFICATIONS.

Written approval of plans and specifications must be obtained from the Chief Engineer prior to start of construction.

Section 706.2. CONSTRUCTION INSPECTIONS.

An agent of the design registered professional engineer must be on site during construction to ensure that techniques and materials used comply with plans and specifications.

Section 706.3. CONSTRUCTION RECORDS.

The applicant (or applicant's engineer) must retain construction records throughout the life of the dam. As a minimum, the records must include:

- A. Daily log of construction activities.
- B. Record of personnel and equipment on site.
- C. Documentation of soil tests such as standard proctor, in-place density, and moisture.
- D. Documentation of concrete cylinder tests.
- E. Copies of all engineering change orders and field change notes.

SEISMIC RISK ZONES

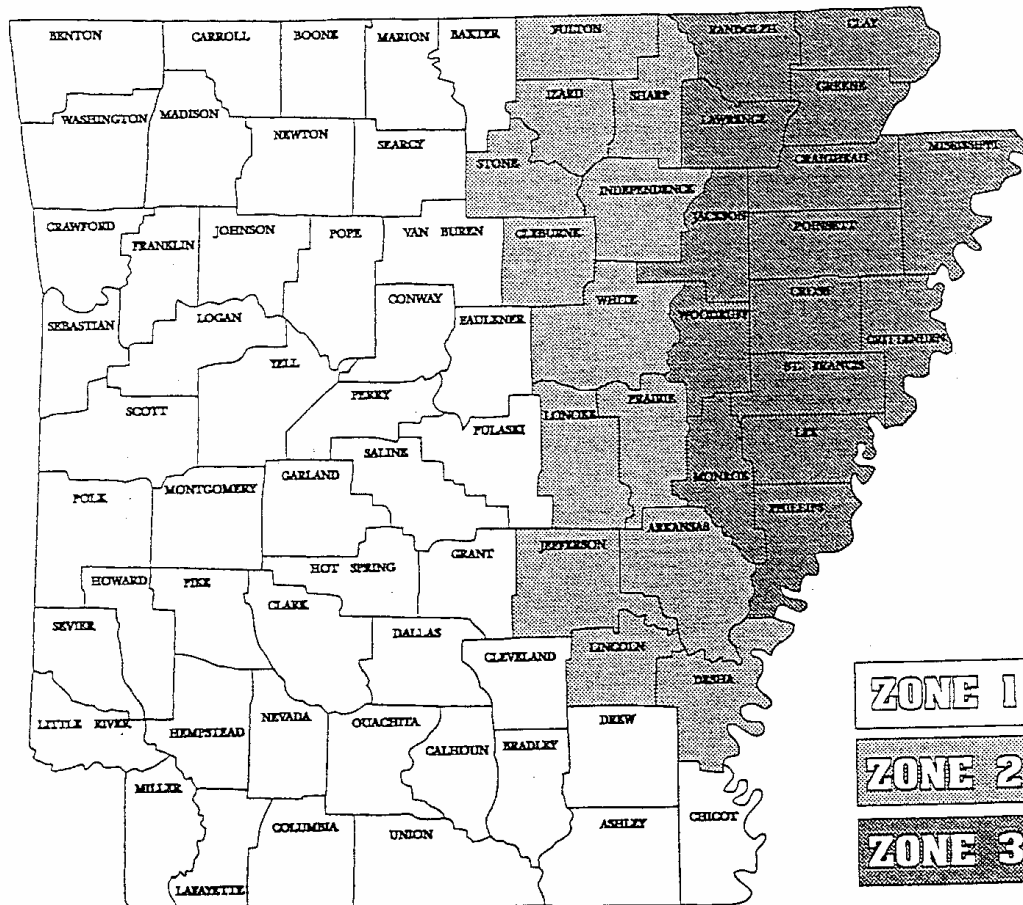


FIGURE 1

During construction, adequate measures must be taken to prevent excessive erosion and off site sedimentation. Suitable techniques include: temporary vegetation, mulching, staked straw bales, filter fences, and chemical stabilization. Other techniques may be used is approved by the Chief Engineer.

Section 706.5. FINAL INSPECTION.

Upon substantial completion of construction, the owner must notify the Commission and schedule a final inspection of the work.

Section 706.6. ENGINEER'S CERTIFICATION.

Upon completion of construction, the project engineer shall file with the Commission a certificate of substantial compliance with approved plans and specifications.

Section 706.7. RECORD DRAWINGS.

Within sixty (60) days after completion of construction, the owner, or his engineer, shall submit to the Chief Engineer a complete set of record drawings of the project for filing as a permanent record with the Commission.

Section 706.8. PERMANENT REFERENCE MARKS.

Two or more permanent reference marks shall be established for future use near but not on the dam. Accurate longitude, latitude and elevation shall be shown on the record drawings. Elevations shall be referenced to the National Geodetic Vertical Datum of 1929.

SUBTITLE VII. EVALUATIONS OF EXISTING DAMS

Section 707.1. TYPES OF EVALUATIONS.

A. Spillway Design Flood. Existing dams will be evaluated periodically to determine if development of downstream areas warrants change in hazard classification and review of spillway design flood (SDF). Overtopping during the SDF may be allowed if properly prepared analyses demonstrate that: (1) overtopping will have a return interval greater than 25 years; and (2) the dam will withstand the projected overtopping without failure.

B. Structural. A complete evaluation of the structural integrity may include the following: geotechnical investigation, structural stability, seismic resistance, horizontal and vertical alignments, structural concrete reliability, erosion controls, inlet and outlet works, stilling basins, seepage, and others.

C. Operation and Maintenance. Evaluation of an existing structure shall include, but not be limited to: visual inspections and evaluations of potential problems such as leakage, seepage, cracks, slides, settlement, spillway blockages, conduit controls and other operational and maintenance deficiencies which could lead to failure of the dam. There may be sufficient evidence for a finding that an existing dam is inadequate.

Section 707.2. DEFICIENCIES.

Dams not meeting minimum acceptable standards (See Subtitle V and VIII) are deemed inadequate and therefore subject to necessary action under Subtitle IV.

Section 707.3. INTERIM ALTERNATIVES.

When the Commission considers the permanent upgrading or removal of an inadequate dam, the dam owner may request the Commission to consider interim alternatives including, but not limited to, temporary repairs, reservoir dewatering, insurance coverage, and downstream warning/evacuation plans. Consideration shall be given to the time required to overcome economic, physical and legal restraints to upgrading, the prospect of permanent repair, current use of the facility, degree of risk, and public welfare.

Section 707.4. VARIANCE.

Upon request by the owner of an existing dam which does not meet the minimum acceptable standards stated in Subtitles V and VIII of this title, the Chief engineer may authorize a variance from these criteria. The Chief Engineer's decision shall consider: (a) consequences of dam failure, (b) the owner's proposal for reduction of hazards, (c) barriers to upgrading of the structure, and (d) other pertinent factors.

SUBTITLE VIII. OPERATION AND MAINTENANCE

Section 708.1. COMPLIANCE WITH APPROVED DOCUMENTS.

Operation and maintenance must be performed in accord with documents filed by the owner or owner's engineer in obtaining the dam permit.

Section 708.2. EROSION PROTECTION.

Maintenance of adequate means to protect embankments, abutments, crests, and earthen channels from erosion is required.

Section 708.3. WOODY VEGETATION PROHIBITED: EMBANKMENT DAMS.

Growth of woody vegetation is not permitted on the spillway, crest, upstream or downstream embankments, and within twenty (20) feet of the downstream toe or groin of the dam.

A. Remediation: Trees with roots likely to extend to the crest of the dam shall be removed. Trees whose roots are unlikely to extend to the crest may remain if erosion control vegetation can be maintained and inspections can be accomplished. Trees larger than six (6) inches in diameter which are to be removed from embankments, must be removed together with roots larger than two inches. The resulting voids shall be repaired with compacted soil similar to the remaining embankment material. Smaller trees and brush, and those not on embankments may be cut and/or treated with herbicide.

B. Time for compliance: New growth must be removed before it shades out desirable vegetation generally on a two-year cycle. Where extensive tree and brush growth were established prior to adoption of these rules, a compliance schedule of up to five years may be approved provided that: (a) No evidence of significant immediate hazard is detected; (b) The compliance schedule includes a reasonable estimate for costs, and a rational procedure for accumulating necessary funds; (c) Vegetation is not so dense that effective inspections are impossible; and (d) Appropriate annual efforts are scheduled. The long-term schedule may be cancelled if evidence of immediate hazards is discovered in subsequent inspections.

Section 708.4. WOODY VEGETATION PROHIBITED; CONCRETE OR MASONRY DAMS.

No grass, vines, brush, trees or other vegetation is permitted to grow in cracks or joint of concrete or masonry structures.

A. Remediation: Vegetation shall be removed by manual, mechanical or chemical means or a combination thereof. Open cracks or joints shall be repaired by approved means.

C. Time for compliance: In the absence of conditions indicating immediate hazards, a schedule resulting in complete compliance within six months may be approved.

Section 708.5. OPERATION OF GATES AND CONTROLS.

All gates, valves and controls, must be maintained in operational condition. Operation of each such item must be tested at least annually, and such tests must be documented in the owner's permanent records. However, tests may be waived by the Chief Engineer if the design of drainage facilities and/or their condition is such that reclosing the drain would be impossible until the reservoir was substantially emptied.

Section 708.6. REPAIRS AND MODIFICATIONS.

Written approval by the Chief Engineer is required before repairs or modifications to a dam or appurtenances may be undertaken. Plans and specifications prepared by a registered professional engineer may be required for major actions.

Section 708.7. RECORDS.

Documentation of all owner's inspections, and repairs or modifications to the dam or appurtenances must be retained by the owner.

SUBTITLE IX. INSPECTION

Section 709.1. OWNER INSPECTIONS.

At least once per year and after each major storm event, the owner (or owner's agent) of all permitted dams must perform a visual inspection of the dam. Results of such inspections must be summarized on forms supplied by the Commission and mailed to the Commission office within 10 days of inspection. Commission staff may provide training or assistance in performing or interpreting inspections. Any deterioration of the dam or appurtenances must be reported to the Commission, and remedial measures undertaken after approval by the Chief Engineer.

Section 709.2. COMMISSION INSPECTIONS.

Commission personnel will periodically perform inspections of each permitted dam. Commission inspections are of three types: Maintenance and Operation; Dam Safety Evaluation; and Emergency. The frequency of inspections and evaluations will vary according to the hazard rating, size and condition of the dam. Emergency inspections will be performed when conditions warrant.

Section 709.3. ACCESS.

The owner or owner's agent must provide Commission personnel access to the dam during reasonable working hours for Commission inspections. Access during emergency conditions must be available to Commission personnel.

Section 709.4. ASSISTANCE BY OWNER.

The owner or owner's agent may be requested to provide limited assistance to Commission personnel in performing inspections. Requested assistance may include:

- A. Operating gates, valves, and other controls.
- B. Cutting excessive vegetation in preparation for inspections.

SUBTITLE X. EMERGENCY ACTION PLANS

Section 710.1. EMERGENCY ACTION PLANS REQUIRED.

An emergency action plan (EAP) must be prepared by the owner for all permitted high hazard dams.

Section 710.2. APPROVAL OF EMERGENCY ACTION PLANS REQUIRED.

Written approval of the Chief Engineer must be obtained for all EAPs.

Section 710.3. CONTENTS OF EMERGENCY ACTION PLANS.

Site conditions will dictate exact contents of specific EAPs. Guidelines for preparation of EAPs are available from the Commission.

Section 710.4. ANNUAL EXERCISES AND DRILLS.

Implementation of EAPs must include at least one tabletop exercise per year and one test drill every three years. The Commission's Chief Engineer must be notified at least one week in advance of either procedure.

SUBTITLE XI. REMOVAL OF DAMS

Section 711.1. APPROVAL OF PLANS REQUIRED.

Prior to removal, a plan for removal and revegetation must be approved by the Chief Engineer.

Section 711.2. NOTICE TO DOWNSTREAM LANDOWNERS.

Downstream landowners must be notified of the proposed action if any measure of flood protection would be lost due to the removal of the dam.

Section 711.3. RIGHTS OF OTHER LANDOWNERS.

Downstream landowners and those adjacent to the reservoir have the right to notice of projected changes in streamflow patterns or reservoir levels, but do not have the right to continued benefits at the dam owner's expense, unless the dam owner is contractually bound to provide such benefits.

Section 711.4. PROCEDURE FOR BREACHING.

The procedure for breaching must adequately guard against downstream flooding, erosion, and sedimentation.

Section 711.5. RESTORATION OF ORIGINAL STREAM CHANNEL.

Dimensions of the final cut through the dam must be defined in the plan and must be of sufficient size to prevent impounding water when streamflow equals the 100-year flood.

Section 711.6. EROSION PROTECTION.

The plan must provide for establishment of vegetation or other erosion protection measures sufficient to guard against deposition of excessive sediment off site.

SUBTITLE XII. GLOSSARY

Unless clearly indicated by context, the following words and terms, when used in this title, shall have meanings as defined below:

- A. Billing volume - Normal storage designed to contain sediment accumulation over the life of the dam.
- B. Chief Engineer - The Deputy Director/Chief Engineer of the Arkansas Soil and Water Conservation Commission.
- C. Commission - The Arkansas Natural Resources Commission.
- D. Construction costs - Estimated or actual material and labor costs, including excavation, embankment placement, spillways, gates, valves, and conduits. Shall not include costs of: land, reservoir clearing, engineering, water treatment facilities, or other costs not directly related to construction of the dam.
- E. Dam - Any barrier, including one for flood detention, designed to impound liquid volumes. This shall not include highway, railroad or other roadway embankments, including low water crossings that may temporarily detain floodwater, levees designed to prevent inundation by floodwater, or closed dikes to temporarily impound liquids in the event of emergencies and those barriers not exempt by Sections 701.3 or 701.4 of this title.
- F. Effective crest of the dam - The elevation of the lowest pint on the crest of the dam excluding spillways.
- G. Executive Director - The Executive Director of the Arkansas Natural Resources Commission.
- H. Height of dam - The vertical distance from the effective crest of the dam to the lowest elevation on the downstream toe of the dam.
- I. Maximum storage - The volume of the impoundment created by the dam at the effective crest of the dam.
- J. Minimum release - Daily quantity of water which must be released to preserve downstream riparian rights, permitted non-riparian rights or to meet instream water needs including, but not limited to those of fish and wildlife.
- K. Normal storage - The volume of the impoundment created by the dam at the lowest uncontrolled spillway crest.
- L. PMF (probable maximum flood) - The maximum runoff condition resulting from the most severe combination of hydrologic and meteorologic conditions that are reasonably possible for a given watershed. The PMF is the maximum runoff computed from the spatial and temporal distribution of the PMP over the watershed.
- M. PMP (probable maximum precipitation) - The greatest theoretical depth of precipitation (rainfall equivalent) for a given duration that is physically possible over a given size storm area at a particular geographical location at a certain time of the year.
- N. Spillway design flood (SDF) - The largest flood the spillway must pass without overtopping a dam.